07 - 10 September 2009

PROCEEDINGS

54. IWK

Internationales Wissenschaftliches Kolloquium
International Scientific Colloquium

Information Technology and Electrical Engineering - Devices and Systems, Materials and Technologies for the Future

Faculty of Electrical Engineering and Information Technology

Startseite / Index:
http://www.db-thueringen.de/servlets/DocumentServlet?id=14089

TECHNISCHE UNIVERSITÄT
ILMENAU

Impressum

Herausgeber: Der Rektor der Technischen Universität Ilmenau
Univ.-Prof. Dr. rer. nat. habil. Dr. h. c. Prof. h. c.
Peter Scharff

Redaktion: Referat Marketing
Andrea Schneider

Fakultät für Elektrotechnik und Informationstechnik
Univ.-Prof. Dr.-Ing. Frank Berger

Redaktionsschluss: 17. August 2009

Technische Realisierung (USB-Flash-Ausgabe):
Institut für Medientechnik an der TU Ilmenau
Dipl.-Ing. Christian Weigel
Dipl.-Ing. Helge Drumm

Technische Realisierung (Online-Ausgabe):
Universitätsbibliothek Ilmenau
ilmedia
Postfach 10 05 65
98684 Ilmenau

Verlag:
Verlag ISLE, Betriebsstätte des ISLE e.V.
Werner-von-Siemens-Str. 16
98693 Ilmenau

ISBN (USB-Flash-Ausgabe): 978-3-938843-45-1
ISBN (Druckausgabe der Kurzfassungen): 978-3-938843-44-4

Startseite / Index:
http://www.db-thueringen.de/servlets/DocumentServlet?id=14089

STATISTICAL CHARACTERISTICS OF DISCRETE SYSTEMS OF PHASE SYNCHRONISATION

Shilin D. Shilin L.

The Belarus state university of computer science and radio electronics
P. Brovka street, 6, Minsk, 220013, Belarus

ABSTRACT

In given article authors the model for statistical tests of systems of phase synchronization which allows to define the basic statistical characteristics is offered and to make the analysis and parametrical synthesis of developed devices at influence of noise on system.

Index Terms **-** pulse systems of phase synchronization, density of distribution of probabilities.

1. INTRODUCTION

At designing of systems of phase synchronization (SPS) one of the major problems is research of statistical characteristics of the device working in the conditions of influence of noise [1]. Authors offered the method of program modeling of processes in SPS at influence of noise, algorithms of processing of results and definitions of the basic statistical characteristics: stationary density of distribution of probabilities of a target signal (DDP), probability of a finding of system in a synchronous mode on the given period of quantization (Pn), average time before synchronism failure (tc), etc.

2. MODEL FOR STATISTICAL TESTS

The Block diagram pulse SPS which noise ξ_{in} (t)

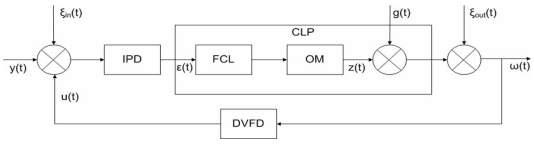

Figure 1. The Block diagram

influence and ξ_{out} (t) is represented on fig. 1

On fig. 1 following designations are entered:

PPD - the pulse-phase detector; CLP - a continuous linear part; FCL - filtration and correction links; OM - object of management; DVFD - a divider with variable factor of division; y (t) - an entrance signal; u (t) - a signal from a feedback chain; z (t) - a target signal of object of management; g (t) - a constant component; ε (t) - a mismatch signal; ω (t) - a target signal of system; ξ_{in} (t) and ξ_{out} (t) - noise on an input and a system exit.

For modeling of processes in SPS the universal model which is based on a principle of the block description is used. Thus functional blocks have the library. For example: phase detectors contain in base analogue, pulse and digital blocks of phase detectors

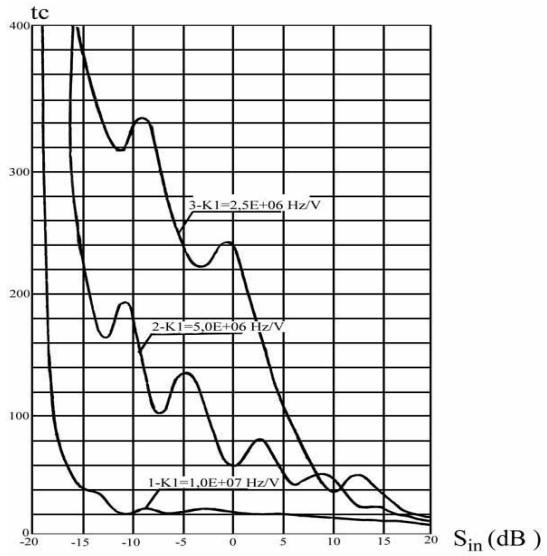

Figure 2.

with various kinds of the discrimination characteristic. Functional blocks with the name «filtration and correction links» allow to model processes in linear electric chains which can be described system of the differential equations.

Modeling is carried out taking into account the equation of short circuit of a chain of a feedback for what on each interval the analysis of phase progression of target co-ordinate is made.

At modeling of processes in SPS on an input and an exit level of influence of noise is set. The pseudo-casual sequence is for this purpose generated, and then the demanded law of distribution which can partially-analytical be described in an influence range is formed.

The fullest statistical characteristic of system is stationary DDP. Its research consists in definition of values of target frequency on each period of work. In advance established quantity is fixed on value of frequencies, and then data processing is made and is under construction stationary DDP a target signal. For an estimation of selective properties of investigated

system authors use such concepts as – interdecile range and interdecile attenuation.

The offered technique also allows receiving probability of a finding of system in a synchronous mode on the given period of quantization at various level of influence of noise. In the course of definition of probability of deduction of synchronism in system the quantity of the periods of work of system before synchronism failure is defined. Making a series, experiences by authors average time before synchronism failure t_c is defined.

On fig. 2 dependence t_c from intensity of noise on a system input (the relation a noise/signal – S_{out}) is shown at various factors of strengthening CLP (K_1). Comparison of the received results of research with existing analytical results says that the basic laws of behavior of schedules coincide, but there is a distinction consisting available of local extremum (fig. 2) which speak the periodic nonlinear characteristic of the used phase detector.

3. CONCLUSION

Thus, authors offer model for statistical tests of systems of phase synchronization which allows to define the basic statistical characteristics and to make the analysis and parametrical synthesis of developed devices at influence of noise on system.

4. REFERENCES

[1] Batura M. , Kuznetsov A., Shilin L. “Analys and parametrical synthesis of pulse systems with phase management.” – Minsk: Science and technics, 1993. – 224 p.

[2] Shahtarin B. “Casual processes in a radio engineering.“ – M: Helios ARB, 2006. – 448 p.

Figure 1 IWK Logo